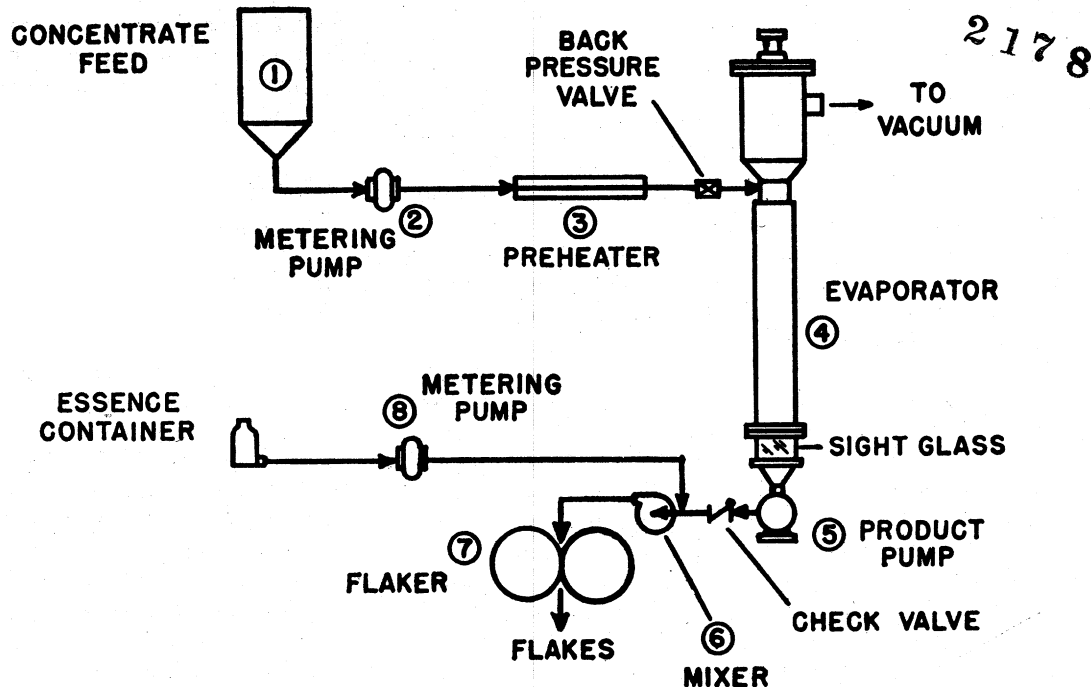


**IMPROVED** cranberry juice powder is processed as shown above. After sweetened juice is concentrated and essence recovered, 65-deg Brix concentrate is metered through pre-heater to vacuum evaporator where moisture content is reduced to 3%. Molten product is then removed from evaporator by product pump and natural flavor constituents added to it. Mixer blends flavor essence into product, which is finally passed through chilling rollers. Brittle flakes taken from rollers are ground to fine powder and packed in cans.



## Returns Essence To Dried Cranberry Juice

USDA method produces sweetened powder which, mixed with water, forms sparkling full-flavored drink

A **DRIED, SWEETENED** cranberry juice with restored natural flavor constituents can now be produced. The process, though using different operating conditions, is essentially the same as that successfully applied to other berry juices, fruit juices, and to honey. A cost analysis for honey, with slight modifications, is applicable here.

In this process, the sirups are rapidly dehydrated in a mechanically agitated thin-film evaporator under vacuum. That produces a practically anhydrous molten material. Then, prior to cooling the anhydrous mass, natural flavor constituents are blended in to give a full-flavored product.

Dried cranberry juice has been prepared formerly by:

1. Hot pulping boiled, fresh cranberries and drying on a drum dryer to a crepe-like film which is then ground, or,

2. Puncturing the skin of whole cranberries with steel needles, drying in forced-draft dryers, then grinding to a fine powder.

Obviously, these products will lose volatile aromas during dehydration. And direct restoration of natural flavor to the powder is impractical. In addition, cranberry juice is extremely high in citric acid and requires added sugar to make an acceptable beverage. Hence, besides lacking natural flavor constituents, these powders also must be sweetened after reconstitution.

This is the first time that successful recovery and concentration of cranberry essence has been achieved. Heretofore, attempts to recover such an essence yielded products which lacked the typical cranberry character. But the essence obtained here had the characteristic aroma of a good fresh cranberry juice. The general previous lack of success may be due to geography, variety maturation, or to still operation. In a Michigan experiment, for example, a lower vaporization rate was used.

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## Preparing the Juice

A palatable beverage or cocktail is made by diluting pure juice with  $1\frac{1}{2}$  to 2 parts of water and adding sufficient sugar to raise the total sugar content to 15-20%. Starting with an 8-deg Brix juice, the ratio of sucrose to cranberry juice solids ranges from about 4:1 to 7:1.

Prior to concentration, a 15-deg Brix sweetened juice was made by adding (by weight) seven parts sucrose to one part pure cranberry juice solids. This juice had been filtered but not depectinized.

These large amounts of sucrose are necessary to make the juice palatable, since cranberries are extremely high in citric acid (3.6%). The average common berry contains only about 1% acid measured as citric acid.

As for operating conditions for thin-film dehydration, the sucrose content is very important. Materials high in sucrose require higher absolute pressures and product temperatures to avoid crystallization. Hence the 7:1 ratio was chosen as representing the extreme in operating conditions for sweetened cranberry juice.

## Concentration and Recovery

Juices to be dehydrated should first be concentrated to at least 62-deg Brix. The technique employed was the single pass atmospheric concentration (SPAC) process which permits simultaneous aroma recovery and juice concentration. The SPAC process consists of preheating the juice, vaporizing the required amount of water for desired concentration, separating, cooling and collecting the concentrate. At the same time, the flavor essence is recovered from the vapor and concentrated as desired in a packed column.

The conditions employed in concentrating the sweetened cranberry juice were as follows:

1. Depectinized, filtered juice was fed at 6 gph and concentrated to 65 Brix. Juice was depectinized by adding 1 gm/gal Pectinol 10-M (Rohm & Haas Co.) and storing at 38F over a weekend.
2. Essence was drawn off at a rate of 3.2 ml/min. That rate makes the essence 100-fold (based on feed rate of sweetened juice).

In order to restore all the flavor constituents and to prevent caking, essence must be concentrated to 1000-fold. In this way addition of water is kept minimal and caking of the powder is prevented. The

high-fold essence was prepared in a 1-in.-diam glass fractioning column packed with 0.16x0.16-in. stainless steel Protruded Distillation Packing (Scientific Development Co.).

## Drying, Adding Essence

A flow sheet with the eight steps of the process is shown above. The 65-deg Brix feed, to which 30 ppm of antifoaming agent has been added, was pumped from tank by metering pump at 46 lb/hr. That gives a product rate of 30 lb/hr dry product.

Before entering the evaporator, juice is preheated to 140-147F in a preheater in which vacuum steam is used as the heating medium. The evaporator employed, a laboratory-size Turba-Film unit with a one-sq ft heating surface (Rodney Hunt Machine Co.), was modified for more efficient product removal.

Vacuum was maintained throughout the run at 7.6 in. Hg absolute by a vacuum regulator. Steam pressure on the jacket averaged 17 psig to give a product temperature of 234F. Product, containing 3% moisture, was removed from evaporator by a pump and, downstream, essence was incorporated into the molten mass by a metering pump.

The molten material with added essence was then mixed in the mixing pump and passed to the nip of the chilling rolls which are cooled by 38-F water.

The product was removed from the rolls as brittle flakes. These were ground through a 6-mesh screen and the product packed in 6-oz cans with an inpack-aged desiccant.

## Product Characteristics

The powder rehydrates to a sparkling clear beverage possessing good flavor. There is no evidence of any scorched or cooked flavors. In addition, tasters who compared beverages reconstituted from powders with and without essence reported the former to be superior. The beverage reconstituted from non-essence bearing powders was reported to leave a bitter after-taste; beverage with added essence was free of this. Other tasters reported that beverages reconstituted from powders with added essence were smoother and had less "bite" than those without the essence.

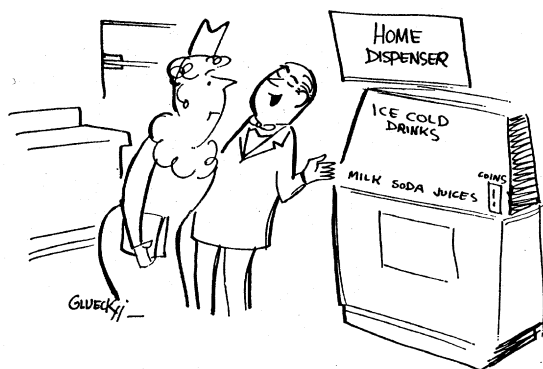
NOTE: Reference to certain products or companies does not imply an endorsement by the Department over others not mentioned.

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